Jet Propulsion Laboratory
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DSN Aperture Enhancement Project

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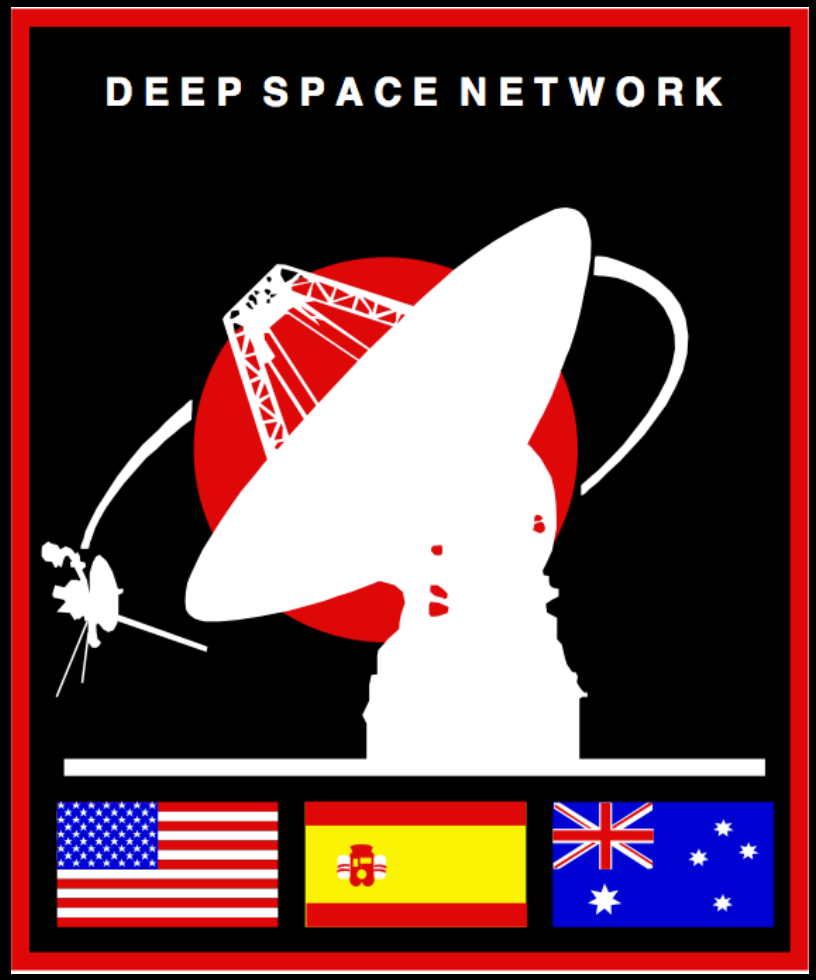
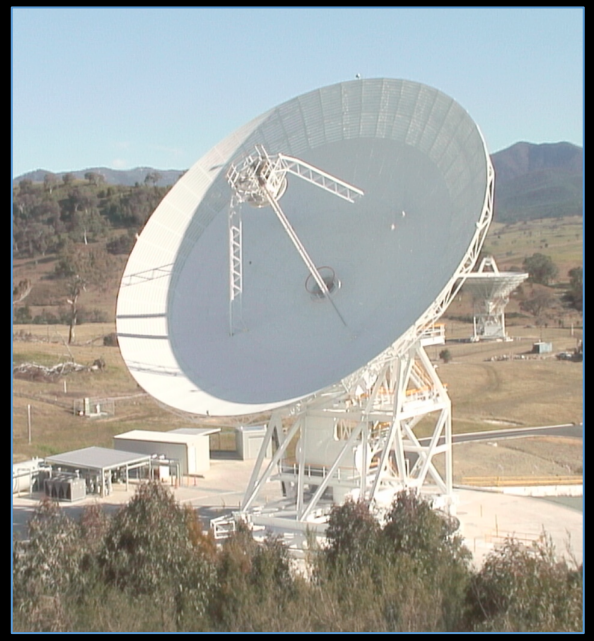
DSN Aperture Enhancement Project (DAEP)

- Add capability to DSN to meet growing need.
- Construct an array of four, 34m Beam Waveguide Antennas at each of the DSN's communications complexes.
- Can be arrayed to backup 70m capability.



DAEP Rollout Plan

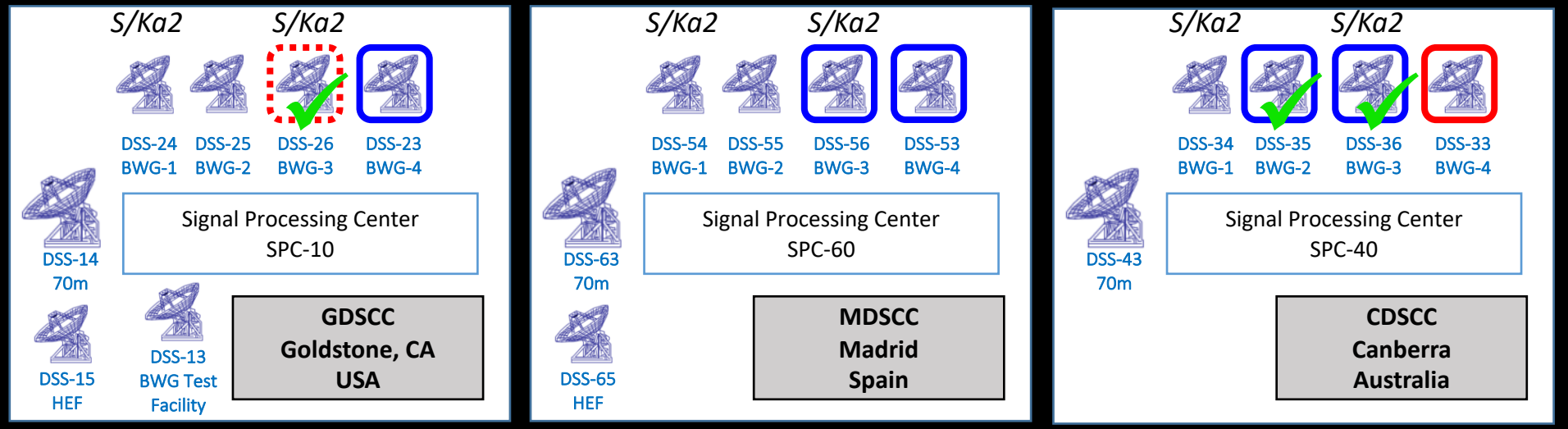


DSS-35 Delivered in 2014

DSS-36 Delivered in 2016

- Started in 2009 with construction of 2 new antennas at the Canberra Complex, delivered in 2014 and 2016.
- Broke ground at the Madrid Complex in 2016 on 2 antennas currently under construction
- Early stages of development for one at the Goldstone Complex to be delivered in 2024
- Final delivery of this phase of development planned for Canberra in 2026.

DAEP Rollout Plan



DAEP Developments

80-kW *TX Only*

80-kW BWG

20-kW BWG

S S-Band Up/Dn

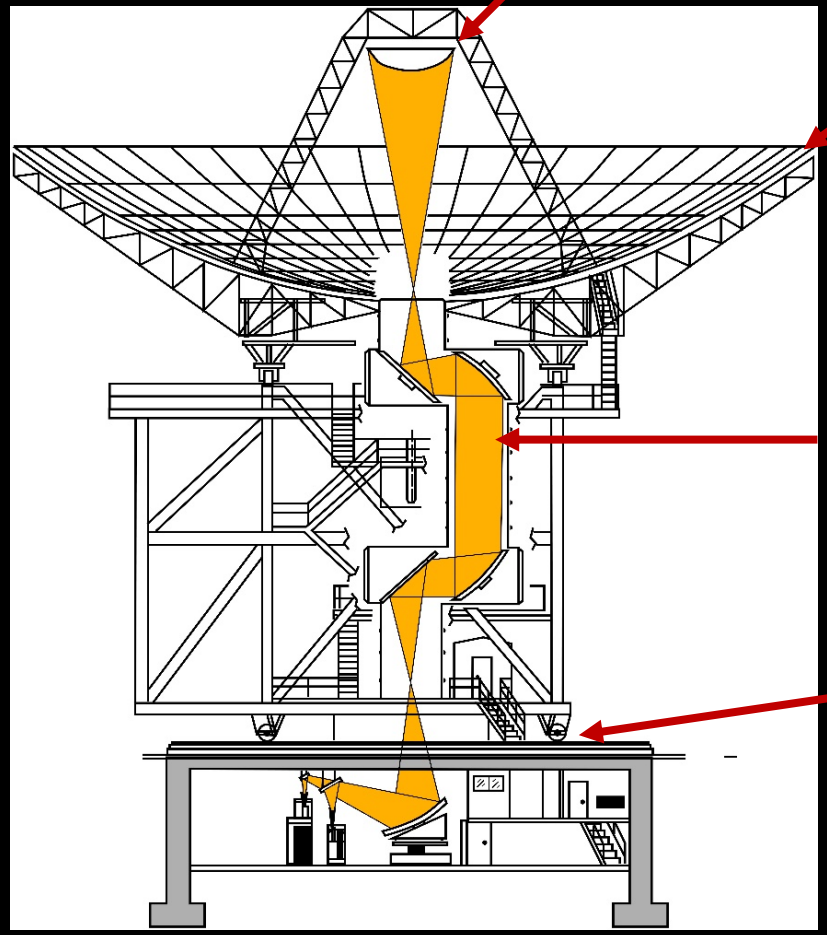
Ka2 26-GHz Dn

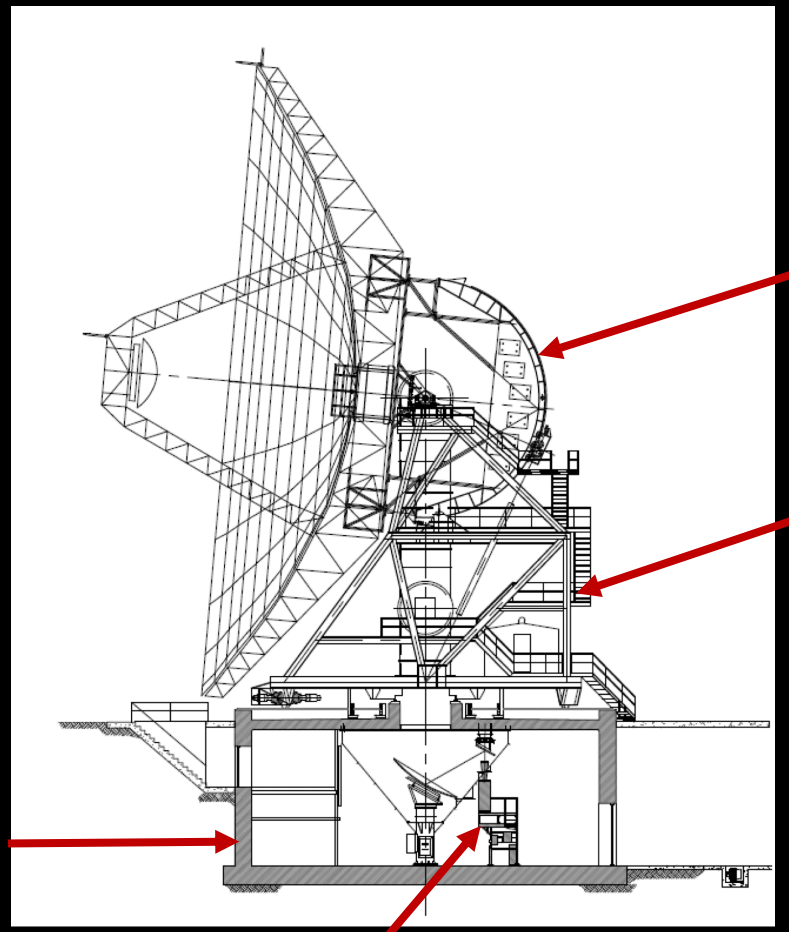
✓ Complete

Station	XX/Ka	S	Ka2
DSS-26		10/2017	(TBD)
DSS-35	10/2014	-	-
DSS-36	10/2016	10/2016	(TBD)
DSS-56	03/2020	03/2020	03/2020
DSS-53	10/2020	-	-
DSS-23	10/2024	-	-
DSS-33	10/2026	-	-

Under Construction

DSN 34m Beam Waveguide Antenna





Madrid Construction Process

Pour Concrete Foundation

Add concrete Walls to Pedestal Structure

Madrid Construction Process

Complete Pedestal construction

Backfill around pedestal

Madrid Construction Process

Install Azimuth Track

Construct Steel Base frame

Madrid Construction Process

Complete Base frame

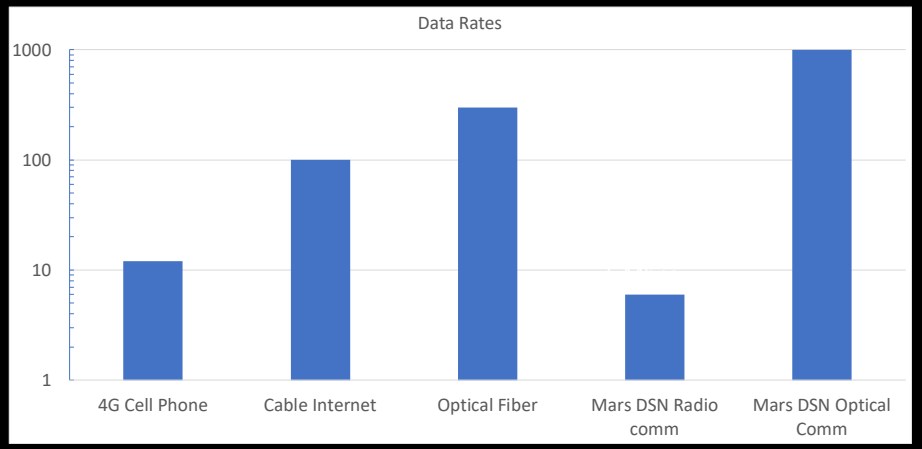
Assemble Reflector

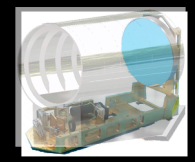
Unique Challenges

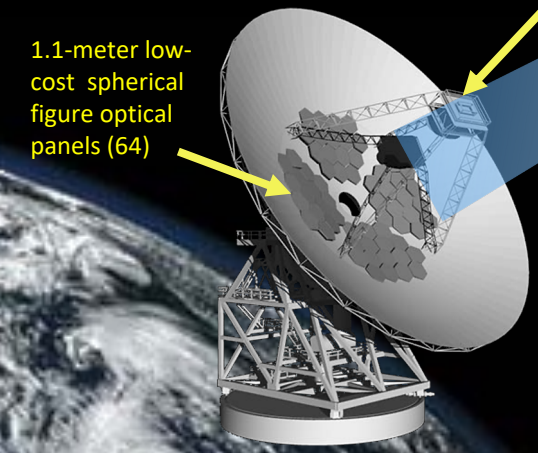
- Precise construction of a very large instrument
- Stringent pointing, tracking, and stability requirements
- Specially designed electronics
  - Receive weak downlink signals
  - Uplink to distant spacecraft requires

Next Generation DSN with High-Rate Optical Communications

- Inexpensive, small, actuated spherical glass mirrors synthesize 8-meter optical aperture inside DSN radio dish
- More than x100 higher data rates versus radio frequency
- Prototype 2019-2020; Implementation 2021-2023;Testing 2023-2025; Operational system at Goldstone in 2025







First DSN Hybrid RF-Optical Antenna available in 2023-2025 for early testing with NASA's Psyche and crewed missions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